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SCIENTIFIC RESEARCH IN SEQUOIA AND KINGS CANYON NATIONAL PARKS

AN ANNOTATED BIBLIOGRAPHY,

UPDATE: 1980-1986

By David J. Parsons

and

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NATIONAL PARK SERVICE
WATER RESOURCES DIVISION
FORT COLLINS, COLORADO
RESOURCE ROOM PROPERTY

SCIENTIFIC RESEARCH IN SEQUOIA AND KINGS CANYON NATIONAL PARKS: AN ANNOTATED BIBLIOGRAPHY, UPDATE: 1980-1986

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INTRODUCTION

This report provides a five year addendum to the 1980 Annotated Bibliography on Scientific Research in Sequoia and Kings Canyon National Parks (Parsons and King 1980). It contains reports and publications received between April 1, 1980 and March 1, 1986. While most of the entries represent new contributions to the literature a few are older documents that have only recently been obtained by the Parks.

This document is designed to supplement the 1980 report. To this end entries are numbered sequentially following the last entry in that version. Copies of both reports can be obtained from the Research Scientists Office, Sequoia and Kings Canyon National Parks, Three Rivers, California 93271.

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BIBLIOGRAPHIES, INDICES AND MANAGEMENT PLANS

344. Parsons, D. J. and V. V. King. 1980. Scientific research in Sequoia and Kings Canyon National Parks: an annotated bibliography. Sequoia Natural History Association, Three Rivers, CA. 70 pp.
Selected technical reports and publications pertaining to scientific or resource management studies within these Parks as of 1980 are presented by subject, with annotations.

345. Sequoia and Kings Canyon National Parks. 1984. Fire Management Plan. National Park Service, Three Rivers, Ca. 215 pp.
The role of fire in these ecosystems and the prescribed fire and wildfire suppression programs are described. This plan acts as the guideline for the operation of all divisions involved in fire activities.

346. Sequoia and Kings Canyon National Parks. 1984. Aquatic/Water Resources Management Plan. National Park Service, Three Rivers, Ca. 94 pp.
Aquatic resources within these Parks are varied, vulnerable to human abuse, and at times can present a danger to visitors. The plan identifies the aquatic resources and specifies research and management objectives and programs for attaining these goals.

347. Sequoia and Kings Canyon National Parks. 1984. Bear Management Plan. National Park Service, Three Rivers, Ca. 94 pp.
The plan aims to restore the natural distribution and behavior of black bears in the Parks and minimize negative interactions between the public and bears. Procedures and policies for handling of bears, area closures and other management actions are specified.

348. Sequoia and Kings Canyon National Parks. 1985. Natural Resources Management Plan. National Park Service, Three Rivers, Ca. 51 pp. With 142 page management program addendum.
High priority research, management and monitoring needs are identified. Activities are combined into projects dealing with broad resource topics for the perpetuation of the Parks' ecosystems. The original Plan of 1976 is revised yearly. The management program prioritizes and summarizes costs of scheduled and proposed projects.

349. Sequoia and Kings Canyon National Parks. 1986. Backcountry Management Plan. National Park Service, Three Rivers, Ca. 34 pp.
The goal of the plan is to provide opportunities for the enjoyment of the backcountry resources of these Parks without their impairment. Management policies in keeping with that purpose are presented.

350. Sequoia and Kings Canyon National Parks. 1986. Stock Use and Meadow Management Plan. National Park Service, Three Rivers, Ca. 46 pp.
Guidelines for the recreational use of saddle and pack stock within these Parks are presented. The meadow resource is described and the goals and evaluation procedures for maintaining meadow conditions are presented.

351. Dozier, J. 1980. A clear-sky spectral solar radiation model for snow-covered mountainous terrain. Water Resour. Research 16(4):709-718.
A computer model using remotely sensed data taken over the Kings River drainage is used to calculate energy budgets over mountainous terrain.

352. Dozier, J. 1980. Use of enviromental satellite data for input to energy balance snowmelt models. Final Report, NOAA Grant, U.S. Dept. of Commerce. 82 p.
Satellite data are used to develop models of energy balance of the snowpack over rugged alpine terrain. An instrument system to ground truth the satellite data was developed. One of the meteorological study sites was located in the Kearsarge Pass area of Kings Canyon.

353. Dozier, J. and J. Frew. 1981. Atmospheric corrections to satellite radiometric data over rugged terrain. Remote Sensing of the Environment 11:191-205.
Satellite radiometry measurements made over the southern Sierra Nevada are used to calculate correction factors for energy budgets in areas of rugged terrain.

354. Marks, D. and J. Dozier. 1979. A clear-sky longwave radiation model for remote alpine areas. Arch. Met. Geoph. Biokl. 27:159-187.
A model to study radiation energy budgets in alpine areas based on thermal satellite data was developed using data collected over the crest of the Sierra.

355. Morgan, D. L. and W. F. Slusser. 1980. Diurnal winds of the southcentral Sierra Nevada. In Proceedings of the Conference on Scientific Research in National Parks. (2nd). National Park Service, Washington D.C. Vol. 5:179-193.
This study examined wind direction and strength in the Kings and Kaweah River drainages to assess the potential for electrical power generation. Generally the winds are not strong enough to be utilized under present technology.

356. Stephenson, N. L. 1985. Climate, snow accumulation, and melt in Sequoia National Park, California. Unpublished report to Sequoia Natural History Association. 56 p. and figures.

Snow collection data from weather stations throughout the Park are analyzed and corrected for catch efficiency. Timing and sequences of snow accumulation and melt are examined for areas east and west of the Great Western Divide.

CULTURE, HISTORY and MANAGEMENT POLICY

357. Bonnickson, T. M. 1983. The National Park Service and local communities: a problem analysis. West. Wildlands 9(2):11-13.

The relationship between local communities and national parks is examined from the perspective of parks as living museums. Changes in NPS policies which might improve the economic condition of local communities are suggested.

358. Bonnickson, T. M. and E. C. Stone. 1985. Restoring naturalness to National Parks. Environ. Manage. 9(6):479-486.

To manage national parks in a "natural" condition quantitative standards of naturalness need to be developed by which to guide and judge the acheivement of this goal. As structural elements of the vegetation alter through decomposition, burning, etc. it will become more difficult to determine the pre settlement state of the ecosystem. The authors suggest a policy of "rescue ecology" to study the remaining ecological information.

359. Evison, B. 1983. How do we monitor the effectiveness of the Biosphere Reserve? Pages 131-143 In Proceedings of Towards the Biosphere: Exploring Relationships Between Parks and Adjacent Lands. USDI National Park Service, Wash. D.C.

While International Biosphere Reserves are established to preserve representative ecological areas, little information exists by which to manage these areas. Guidelines for managing Biosphere Reserves are suggested. Examples are provided from the Great Smoky Mountains and Sequoia and Kings Canyon.

360. Fee, D. J. 1980. An archeological assessment of Sequoia and Kings Canyon National Parks, California. Report to Western Archeological Center, Tucson, Arizona. 72 p.

The history and ethnography of early European and preEuropean settlement in the Parks is summarized. The status of archeological investigations carried out between 1959 and 1979, comprising only 0.4% of the Parks' area, is discussed.

361. Frakes, C. 1985. Attitude of visitors towards possible increased fees and new fees at federal recreation areas. Term paper for Business Research Methods 221, Cal State Univ. Fresno. 29 p.

Visitors at Grant Grove and the Sherman Tree were polled for one day regarding their attitudes towards paying increased fees for use of federal recreation facilities. The results indicated that those surveyed would be willing to pay increased fees rather than face a decline in services provided at these areas.

362. Graber, D. M. 1983. Rationalizing management of natural areas in national parks. Bull. George Wright Society. 4:48-56.

The policies which direct the management of National Park resources are reviewed relative to past and present ambiguities. Examples from Yellowstone and the Sierran parks illustrate dilemnas in park management. The principle of the Ecological Preserve, allowing essentially unimpeded interaction of ecosystem processes and structural elements, is proposed in order to recognize the increasing value of parks as "laboratories of natural ecological processes".

363. Hydrick, R. 1984. The genesis of national park management: John Roberts White and Sequoia National Park, 1920-1947. Journal of Forestry. 28(2):68-81.

Colonel John Roberts White, superintendent of Sequoia N.P. from 1920 until the 1940's, initiated many policies which guide park management to this day. White's superintendency is traced from its early days as a Mather appointment, emphasizing his interest in preservation of the backcountry and the natural history of the parks.

364. Lewis, J. D. 1981. Our national Christmas tree. National Wildlife 19(1):44-47.

Presents the history of how the General Grant Tree became the National Christmas Tree as well as general information on giant sequoias.

365. Norris, L. L. 1982. Research in Sequoia and Kings Canyon National Parks. Western Tanager 48(10):1,6-7.

The justification for research in the Parks as well as the status of such recent projects as a rare plant inventory, meadow classification, fire ecology, black bear ecology, and the effects of acid rain are discussed.

366. Rombold, C. C. 1981. The National Park Experience: Normative and Interpretive Perspectives. Ph.D. Dissertation. University of California, Davis. 397 p.

Field research conducted in Sequoia and Yosemite provides the setting for this study on how individuals and groups move through their park experience. Components of a park experience are divided into the normative or objective portion and the interpretive or subjective portion. Activities can be classified by the predominance of either quality. The author indicates that the frontcountry experience is overlooked by the Park Service in its potential as an interpretive experience.

367. Stowell, R. D. Jr. 1972. The Sequoia and Kings Canyon National Parks Recreation Complex. M. A. Thesis, UCLA. 128 p.

National Parks exist within a complex of recreational areas which serve different functions for the public. Parks serve as focal points within the complex and other areas develop as subsidiary or unique units. This becomes more evident as an increasing number of popular recreational activities are judged incompatible with National Park use.

ENTOMOLOGY, PATHOLOGY and POLLUTION DAMAGE

368. David, C. T. and D. L. Wood. 1980. Orientation to trails by a carpenter ant, Camponotus modoc, (Hymenoptera:Formicidae), in a Giant Sequoia Forest. Can. Ent. 112:993-1000.

Maps were constructed of carpenter ant trails in nine 1 ha plots in Giant Forest. Experimental manipulation of the ant trail by actual disruption of the trail and by screening of the visual horizon led to the conclusion that the ants orient by chemical and visual cues. Orientation to visual cues appears to survive for at least six months.

369. Duriscoe, D. M. 1983. An air quality monitoring plan for Sequoia and Kings Canyon National Parks. In Proceeding: First Biennial Conference of Research in California's National Parks. Univ. of Calif., Davis. Pp. 8-14.

Although the Parks have been designated as an area of pristine air quality, many pollutant sources violate the quality of the atmospheric resource. A program to identify pollutant forms and concentrations and corresponding enviromental effects is necessary. Some of the elements of such a plan - visibility degradation, ozone and acid rain monitoring - are described.

370. Evison, B. 1985. Air pollution and Sequoia and Kings Canyon National Parks. Pages 95-102 in Proceedings - Conference on the Management of Biosphere Reserves. USDI National Park Service, Great Smoky Mountains National Park, Gatlinburg, TN.

Air pollution reaches these Parks in large quantities with unknown effects. Research has begun to study ecosystem processes, pollution inputs, visibility, and long term changes which may be caused by air pollution. A coordinated effort between NPS and outside researchers promises to yield valuable information for management and future research.

371. Lawson, D. R. and J. G. Wendt. 1982. Acid deposition in California. Society of Automotive Engineers Technical Paper Series 821246. 19 p.
Precipitation chemistry measurements throughout California indicate that California's acid deposition is locally produced within urban areas. Data for rainfall chemistry indicates that nitric acid dominates over sulfuric acid at many California sites, in contrast to other locations in the world. Data from Giant Forest illustrate this situation.

372. Miller, P. 1985. The impacts of air pollution on forest resources. Forestry Research West. August 1985. Pp. 1-5.
Current research into air pollution effects on forests includes several projects in these Parks. Fumigation studies of pollutant effects on giant sequoia and black oak seedlings, tree ring growth surveys, and dry deposition/vegetation throughfall monitoring are cooperative projects between the Park Service and Forest Service.

373. Miller, P. R., K. W. Stolte, T. L. Franklin, A. P. Gomez and C. A. Kazmier. 1984. Ozone effects on important tree species of the Sequoia-Kings Canyon National Parks. Final Report for Interagency Agreement No. 0492-82-04. USDA Forest Service, Riverside. 57 p. and appendices.
Study plots were established to assess the effects of ozone on the establishment and survival of Giant Sequoia seedlings and to develop ozone biomonitoring techniques using foliage damage to black oak leaves as indicators. Over 500 Sequoia seedlings in five recently burned groves were assessed twice in 1983 for symptoms resembling ozone damage as observed in laboratory fumigation experiments. Black oak study plots, located in areas with ongoing pine monitoring studies, will serve to identify summer seasons and locations with unusually high ozone concentrations.

374. Peterson, D. L. 1985. Evaluating the effects of air pollution and fire on tree growth by tree ring analysis. Proceedings - 8th Conference on Fire and Forest Meteorology. Society of American Foresters. Pp. 124-131.

Dendrochronology is being used to differentiate between changes in tree growth caused by aging or climatic factors and those caused by air pollution, fire, or competition stresses. Study plots need to be selected which provide a control area from which to develop an initial chronology. Examples from stressed Jeffrey pines in Sequoia-Kings Canyon are presented.

375. Vogler, D. R. 1980. Ozone and conifer injury in Sequoia and Kings Canyon National Parks. In Proceedings - 2nd Conference on Scientific Research in National Parks. (2nd). National Park Service, Washington D.C. Vol. 5:79-91.

Levels of ozone exceeding State and Federal standards were measured during summer months. Data from nearby sites indicate a daily pattern of pollutant transport into the park from urban areas to the west. Conifer injury was found to be slight to moderate, with occasional individuals suffering more severe damage.

376. Vogler, D. R. 1982. Ozone monitoring in the southern Sierra Nevada, 1976 - 1981. Report No. 82-17, U.S. Forest Pest Management, Pacific Southwest Region. 43 pp.

Ozone levels were measured at several sites along the western edge of the southern Sierra including Park Ridge Lookout and the Lodgepole Ranger Station, and Whitaker's Forest. Though levels varied at the sites, the pattern suggests that potentially harmful ozone levels exist throughout the region.

377. Vogler, D. R. and J. Pronos. 1980. Ozone injury to pines in the southern Sierra Nevada. Page 253 In Proceedings of Symposium on Effects of Air Pollutants on Mediterranean and Temperate Forest Ecosystems. USDA Forest Service Gen. Tech. Report PSW-43.

Injury to pine species in the western Sierra Nevada is presently slight overall, with local areas of moderate or severe injury. Some correlations with increased drought stress following the severe 1977 drought were noted.

378. Warner, T. E., D. W. Wallner and D. R. Vogler. 1982. Ozone injury to ponderosa and jeffrey pines in Sequoia and Kings Canyon National Parks. Pages 1-7 In Proceedings of the First Biennial Conference of Research in California's National Parks. Univ. Calif. Davis.
Installation and evaluation of ozone injury plots in areas of the Parks between 4000 and 8000 feet has revealed foliar injury ratings from none to severe on individual pine trees and overall plot damage rated from none to severe. Injury was found on 37% of the trees sampled.

379. Williams, W. T. 1981. Long distance transport of air pollution into Sequoia, Kings Canyon, Yosemite and Lassen National Parks. In Proceedings - Conference on Scientific Research in National Parks (2nd). National Park Service, Washington D.C. Vol. 5:165-169.
Air pollution from frontal wave transport and point source transport affect the national parks on the western slope of the Sierra Nevada. Implications of current levels of pollution and the potential impacts of proposed power plants on Lassen are discussed.

380. Williams, W. T. 1983. Tree growth and smog disease in the forests of California: a case history, Ponderosa Pine in the southern Sierra Nevada. Environ. Poll. 30:59-75.
Ponderosa pine can act as a sensitive bioindicator of air pollution stress to forests. Four permanent plots located within Sequoia were rated for smog injury and tree growth parameters and are compared with plots in the San Bernadino Mountains. Moderate damage was found in the Sequoia plots and continuing damage would be expected as air pollution increases in the Central Valley.

See also reference numbers 414, 417, 494.

FIRE ECOLOGY

381. Baker, G. A., P.W. Rundel and D. J. Parsons. 1982 Postfire recovery of chamise chaparral in Sequoia National Park, California. Page 584 In Proceedings - Dynamics and Management of Mediterranean-type Ecosystems. USDA Forest Service Gen. Tech. Report PSW-58.

Chamise mortality following fire was compared in paired spring and fall burn and clipped plots . Shrub mortality was higher in the spring treatments due to the depletion of root carborhydrate reserves during the spring growing season. Fall mortality was low and pre-burn shrub density maintained, leaving little potential for seedling establishment. Preburn biomass was found to be a determinant of post-burn survival and growth rate.

382. Bancroft, L., T. Nichols, D. Parsons, D. Graber, B. Evison, and J. van Wagtendonk. 1985. Evolution of the natural fire management program at Sequoia and Kings Canyon National Parks. Pages 174-180 In Proceedings - Symposium and Workshop on Wilderness Fire. USDA Forest Service Gen. Tech. Report INT-182.

These Parks were the first national parks to institute a program that includes both natural ignitions and prescribed fire. The Leopold Report of 1963 and early fire research directed further studies that led to implementation of a fire management plan in the late 1960's. The uses and goals of prescribed burning evolved during the 1970's, and are still refined as information becomes available.

383. Bonnickson, T. M. 1985. Ecological information necessary for park and wilderness fire management planning. Pages 168-173 In Proceedings - Symposium and Workshop on Wilderness Fire. USDA Forest Service Gen. Tech. Report INT-182.

The author states that standards are necessary to judge the success of restoring natural conditions and that in the absence of such standards managers are relying on "faith" to accomplish their goals. He is concerned about the loss of physical evidence of forest structure upon which standards for the reconstruction of presettlement forests could be based.

384. Botti, S. J. and T. Nichols. 1980. The Yosemite and Sequoia-Kings Canyon prescribed natural fire programs 1968-1978. In Proceedings - Conference on Scientific Research in National Parks (2nd). National Park Service, Washington D.C. Vol. 10:46-63.
Prescribed natural fire has been reintroduced into the three parks starting in 1968. The management zones have been gradually expanded to include subalpine, lodgepole-hemlock, red fir and mixed conifer communities. The characteristics of 325 natural fires are summarized by size, duration and fire behavior. Further expansion of the natural fire zone will be considered as more is learned of fire characteristics in the lower mixed conifer and chaparral types.

385. DeBenedetti, S. H. Establishment of vegetation following fire in a subalpine meadow of the southern Sierra Nevada: one year post-burn. In Proceedings - Conference on Scientific Research in National Parks (2nd). National Park Service, Washington D.C. Vol. 10:325-336.
A lightning caused fire burned a majority of Ellis Meadow, a subalpine meadow in Kings Canyon, during the summer of 1977. The fire burned for two months before fall precipitation extinguished it. Comparison of plant succession between immediate post burn conditions and one year after the fire shows that most of the surface was stabilized and revegetated.

386. DeBenedetti, S. H. and D. J. Parsons. 1984. Postfire succesion in a Sierran subalpine meadow. Amer. Midl. Nat. 111(1):118-125.
Vegetation reestablishment following a lightning ignited fire in Kings Canyon was followed for four years, during which time the herbaceous cover increased to 123%. Dominant species shifted from broadleaf species in the first post fire year to graminoid species in the later years.

387. Ewell, D. and H. T. Nichols. 1985. Prescribed fire monitoring in Sequoia and Kings Canyon National Parks. Pages 327-33- In Proceedings - Symposium and Workshop on Wilderness Fire. USDA Forest Service Gen. Tech. Report INT-182.

Fire monitoring operates on two levels- a short term level which assesses fire behavior and immediate post-burn effects such as scorch height, and a long term level which seeks to document site specific changes due to fire and its effects. Permanent plots that are established prior burning are to be remeasured at periodic intervals and data analyzed to evaluate changes in forest succession, fuel loading,. etc.

388. Graber, D. M. 1985. Coevolution of National Park Service fire policy and the role of national parks. Pages 345-349 In Proceedings - Symposium and Workshop on Wilderness Fire. USDA Forest Service Gen. Tech. Report INT-182.

Fire policy is traced through the history of the Park Service as it reflects the changing philosophies of society and a greater understanding of ecological factors at work in large wilderness areas.

389. Greenlee, J. M., J. Villeponteaux, and E. Sheekey. 1980. Natural fire in the Sierra Nevada, California. In Proceedings - Conference on Scientific Research in National Parks (2nd). National Park Service, Washington D.C. Vol. 10:293-312.

Pre and post burn soils and vegetation were compared on two natural lightning fire sites in the Sugarloaf Valley area. Small pines survived light burning but high mortality of white fir resulted. Trees in the brush communities showed greater mortality and herb populations indicated a trend towards pre burn levels.

390. Harvey, H. T., H. S. Shellhammer, and R. E. Stecker. 1980. Giant Sequoia Ecology: Fire and Reproduction. Scientific Monograph Series No. 12. National Park Sevice, Washington D.C. 182 p.

A large, multidisciplinary study of giant sequoia ecology was conducted from 1964 to 1975 in the Redwood Mountain grove. This monograph summarizes the scientific methods of the various studies and relates the results to sequoia reproduction, succession and management.

391. Omi, P. N. 1980. Fuel dynamics in two natural fires in Sequoia and Kings Canyon National Parks. In Proceedings - Conference on Scientific Research in National Parks (2nd). National Park Service, Washington D.C. Vol. 10:337-345.

Forest fuel inventories in burned and unburned areas of two lightning ignited fires in Sugarloaf Valley are analysed in order to better understand natural fire regimes and management implications for areas under natural fire management programs.

392. Parsons, D. J. 1980. The historical role of fire in the foothill communities of Sequoia National Park. Madrono 28(3):111-120.

Reviews the available information on fire history in the foothill chaparral and oak-woodland communities in pre and post settlement times and summarizes fire size and ignition sources.

393. Parsons, D. J. 1981. Fire in a subalpine meadow. Fremontia 9(2):16-18.

The history and consequences of a lightning ignited fire that burned most of Ellis Meadow at an elevation of 8,800 feet in Kings Canyon are presented. Post fire plant succession and effects on lodgepole pine encroachment are discussed.

394. Parsons, D. J. 1981. The role of fire management in maintaining natural ecosystems. Pages 469-488 In Proceedings - Conference on Fire Regimes and Ecosystem Properties. USDA Forest Service Gen. Tech. Report WO-26.

To preserve naturally functioning ecosystems which have evolved with fire a management plan integrating fire history and management goals needs to be formulated and implemented. This paper reviews the history of the recognition of fire as an important ecological factor as well as the use of both natural ignition and prescribed burning to help perpetuate natural ecosystems. Examples of successful natural fire management programs as well as guidelines detailing the types of information needed to develop such are presented.

395. Parsons, D. J. 1982. A foliage moisture sampling program for the foothill chaparral of Sequoia National Park. Unpublished National Park Service Report. 13 p.

This study was designed to provide information on the variability of live foliage moisture of chaparral shrubs. Study sites represent a gradient of elevation and exposure. Moisture content of live material is a primary determinant of fire behavior in chaparral, and should be considered when predicting the behavior of wild or prescribed fire.

396. Parsons, D. J. 1982. Fire Management and vegetation effects in mediterranean-type ecosystems: a summary and synthesis. Pages 472-474 In Proceedings - Symposium on Dynamics and Management of Mediterranean-type Ecosystems. USDA Forest Service Gen. Tech. Report PSW-58.

Summarizes papers presented at the conference which dealt with examples of the types of information necessary to develop a fire management program. It is emphasized that complete understanding of a region's fire regime requires research closely tied to the management program.

397. Parsons, D. J., D. M. Graber, J. K. Agee, and J. W. van Wagtendonk. 1986. Natural fire management in National Parks. Environ. Manage. 10(1):21-24.

Despite ambiguities, National Park Service policy must remain dynamic and reflect increasing knowledge of ecological functions in natural areas. It is proposed that the policy goal should be the unimpeded interaction of native ecosystem processes and structural elements. Natural fire is used as an example of such an ecosystem process.

398. Parsons, D., L. Bancroft, T. Nichols and T. Stohlgren. 1985. Information needs for natural fire management planning. Pages 356-359 In Proceedings - Symposium and Workshop on Wilderness Fire. USDA Forest Service Gen. Tech. Report INT-182.

The development and implementation of a natural fire management program requires a clear definition of goals and objectives, an ever-expanding information base, and effective program evaluation. Examples from Sequoia and Kings Canyon are given.

399. Parsons, D. J. and R. P. Hedlund. 1980. Fire history in the foothill zone of Sequoia National Park. In Proceedings - Conference on Scientific Research in National Parks (2nd). National Park Service, Washington D.C. Vol. 10:104-118.

The recent fire history of the foothill chaparral and oak-woodland communtities is reviewed. Park records are summarized since 1920. Data is presented on ignition source, time of year and vegetation type.

400. Pitcher, D. C. 1981. The ecological effects of fire on stand structure and fuel dynamics in red fir forests of Mineral King, Sequoia National Park, California. M.S. Thesis, Univ. of California, Berkeley. 168 p.

Fire history, stand structure and fuel loadings were studied in three large red fir dominated permanent plots in the Mineral King area. Results tend to show that the fire free interval has not been significantly changed within this century.

401. Rundel, P. W. and D. J. Parsons. 1984. Post-fire uptake of nutrients by diverse ephemeral herbs in chamise chaparral. Oecologia 61:285-288.

A diverse herb community dominates the chaparral during the first years of growth following a fire. Nutrient uptake by these herbs is substantial and may serve as a reservoir of nutrients during a time period when erosion of ash may otherwise deplete the nutrient pool available for shrub regrowth.

402. Rundel, P. W., D. J. Parsons and G. A. Baker. 1980. The role of shrub structure and chemistry in the flammability of chaparral shrubs. In Proceedings - Conference on Scientific Research in National Parks (2nd). National Park Service, Washington D.C. Vol. 10:248-260.

Shrub structure and foliage chemistry may promote fire through surface area to volume ratios, seasonal changes in foliage moisture, and accumulation of volatile ether compounds. Factoring these types of components into existing fire models can assist managers involved with fire in the chaparral. Data is presented for chaparral shrubs in Sequoia.

403. Rundel, P. W., G. A. Baker and D. J. Parsons. 1981. Productivity and nutritional responses of Chamaebatia foliolosa (Rosaceae) to seasonal burning. Pages 191-196 In Margaris, N. and H. Mooney (eds.) Components of Productivity of Mediterranean Climate Regions - Basic and Applied Aspects. W. Junk, The Hague.

Chamaebatia, a highly flammable mid-elevation understory shrub, was burned in spring, summer, and fall 1978 to investigate the direct effects of fire on stand productivity and nutrient utilization. Burning returned significant amounts of nutrients to the soil which increased growth rates in the season following the fire. The seasonality of burning clearly affected regrowth; spring and fall fires stimulated regrowth while summer fire appeared to inhibit it.

404. Rundel, P. W., G. A. Baker, D. J. Parsons and T. J. Stohlgren. 1985. Post-fire demography of resprouting and seedling establishment by Adenostoma fasciculatum. In Catarino, F. (Ed.). Plant Response to Stress - Functional Analysis in Mediterranean-type Ecosystems. Springer-Verlag, New York, N.Y.

Adenostoma fasciculatum (chamise), a dominant species in California chaparral, reproduces by resprouting and reseeding following fire. Post-fire successional patterns of these two reproductive stategies are examined from demographic and physiological perspectives. Field studies were conducted in mature stands of chamise in the foothills of Sequoia National Park.

405. Stohlgren, T. J. 1985. Fire-caused mortality in chamise chaparral. Pages 385-387 In Proceedings-Symposium and Workshop on Wilderness Fire. USDA Forest Service Gen. Tech. Report INT-182.

Pure stands of chamise chaparral in the foothills of Sequoia were assessed for mortality at sites which had been recently burned. Natural thinning mortality, predominantly in the smallest size classes, was subtracted from total postburn mortality and the largest size classes were found to have the highest fire induced mortality rates. Mid size shrubs, less susceptible to thinning mortality yet without the large accumulation of dead woody debris of the larger shrubs, were most likely to survive fire.

406. Warner, T. E. 1980. Fire History in the yellow pine forest of Kings Canyon National Park. Pages 89-92 In Proceedings of the Fire History Workshop. USDA Forest Service Gen. Tech. Report RM-81.

Early results from a fire scar history study in the Cedar Grove area of Kings Canyon indicate a mean fire frequency per individual tree of 11 years for the period from 1775-1909 and an average of 1 fire per 3.5 years over the approximately 400 acre area sampled.

407. Vankat, J. L. 1985. General patterns of lightning ignitions in Sequoia National Park, California. Pages 408-411 In Proceedings-Symposium and Workshop on Wilderness Fire. USDA Forest Service Gen. Tech. Report INT-182.

Lightning ignitions in Sequoia were found to be nonrandom for factors such as location, elevation, slope, aspect and vegetation type. Lightning ignitions were most frequent west of the Great Western Divide, in the lower Kern Canyon, and in the elevation zone between 8200 and 9020 feet.

See also reference numbers 345, 358, 374, 450, 451, 453, 454, 457, 473, 482, 483, 490.

FISHERIES and AQUATIC BIOLOGY

408. Abell, D. L. 1980. Species diversity in benthic invertebrate associations of the Kaweah River in Sequoia National Park, California. In Proceedings of the Conference on Scientific Research in National Parks (2nd). National Park Service, Washington D.C. Vol. 2:105-124.
Macroscopic invertebrate collections from throughout the Kaweah River drainage display a general increase in diversity and abundance from small to large streams. Histograms of the data are related to environmental conditions found in the streams and allow easy comparison between streams.

409. Bradford, G. R., F. L. Bair and V. Hunsaker. 1968. Trace and major element contents of 170 High Sierra lakes in California. Limnol. and Oceanog. 13(3):526-530.
Phytoplankton growth is dependent on the presence of certain trace as well as major major elements. Differences in productivity of otherwise similiar neighboring lakes may be attributed to the supply of these trace elements. Water samples collected from 101 lakes in Sequoia and Kings Canyon and 67 in Yosemite were analyzed by spectrographic techniques for 21 elements. Data is presented in summarized form with an appendix describing the individual lakes.

410. Bradford, G. R., A. L. Page and I. R. Straughan. 1981. Are Sierran lakes becoming more acid? Calif. Agric. 35(5,6):6-7.
Comparison of Sierran lake samples collected in 1965 and 1980 show essentially no change in acidity. A very low buffering capacity was evident in both sets of samples.

411. Bradford, G. R., C.A. Fox, A. L. Page and A. A. Elseewi. 1983. Evaluation of acidity and chemical composition of high elevation lakes in California. Paper presented at National Atmospheric Deposition Program, Nov. 7-10, 1983. Knoxville, TN. 22 p.
124 lakes in Sequoia, Kings Canyon and Yosemite were sampled by helicopter each July for four years and chemical analysis of the water conducted. Results indicate that these waters have low capacity to buffer acid inputs. Comparisons with sampling done in 1965 show no increase in acidity or ion concentrations.

412. El-Amanay, M. M., G. R. Bradford, A. L. Page, S. C. Nodvin and C. A. Fox. 1984. The alkalinity of pristine lakes in the high Sierra mountains. In Proceedings-77th Annual Meeting of the Air Pollution Control Association. 84-22.7, 9 p.

Samples of lake water from 124 high elevation lakes were tested for alkalinity using two methods to investigate the applicability of a technique for computing alkalinity from pH and CO2. Results were comparable between the two methods; both indicating a low level of alkalinity in Sierran lakes, most of which is derived from bicarbonate.

413. Kubly, D. M. 1983. Plankton of high Sierra lakes. Southern California Edison Research and Development Report No. 83-RD-47. 96 p.

Vertical tows of plankton were collected from 41 high elevation lakes in July 1982 and samples identified to species. Zooplankton populations were generally low. A transition in size structure from crustaceans to rotifers was noted which related statistically to an altitudinal gradient. The phytoplankton associations are indicative of oligotrophic lakes, with neutral pH forms predominant.

414. Lee, V. F. 1985. Macrovelia hornii Uhler, a cave-inhabiting semiaquatic bug. Pan-Pacific Entomologist 61(3):263-264.

Collections of this bug were made in caves of Redwood Canyon, Kings Canyon National Park. The cave record is the first for this species and the second for a semiaquatic bug in the Neartic Region.

415. Melack, J. M., J. L. Stoddard and D. R. Dawson. 1982. Acid precipitation and buffer capacity of lakes in the Sierra Nevada, California. Pages 35-42 In Proceedings - International Symposium on Hydrometeorology. American Water Resources Association. Bethesda, Md.

Acid rain (ph 3.7 to 4.9) occurred during convective storms over the eastern central Sierra Nevada during the dry season of 1981. However, snow pH ranged from 5.2 to 6.1 and had low ionic concentrations. A survey of 70 alpine lakes showed most were weakly buffered bicarbonate lakes with a majority of lakes under 60 uEq/1 alkalinity, hence very sensitive to acid input.

416. Melack, J. M., J. L. Stoddard and C. A. Ochs. 1985. Major ion chemistry and sensitivity to acid deposition of Sierra Nevada lakes. Water Resour. Res. 21:27-32.

Seventy-three lakes in basins representative of Sierran bedrock were sampled in 1981-82. The median alkalinity was 50 ueq/l and pH was 7. The alkalinity of lakes cannot be predicted from altitude or the lake or basin area, but is positively correlated with the percent areal extent of volcanic or calcereous rocks in the basins.

417. Parsons, D. J. and D. M. Graber. 1985. Integrated watershed research undertaken at Sequoia National Park. Park Science. 5(2):22-24.

As part of a nationwide long term effort to determine the effects of acidic deposition on natural ecosystems, watersheds in three elevational zones of Sequoia are being intensively studied. Rain and stream chemistry and vegetation are being monitored by the National Park Service while a large number of cooperators are researching other aspects of the watersheds in order to develop a comprehensive ecological model of the basins.

418. Tonnessen, K. A. and J. Harte. 1982. Potential for acid precipitation damage to lakes of the Sierra Nevada, California. Pages 75-78 In Proceedings - International Symposium on Hydrometeorology. American Water Resources Association. Bethesda, Md.

Acid precipitation has been measured in the Sierra Nevada and may affect lakes in high elevation, granitic areas. 35 lakes in the Sierra were sampled for pH, alkalinity and ions. Microcosm systems of several lakes were established in a laboratory experiment and acidified with nitric acid to simulate acidification processes which might occur with continuing acid deposition.

See also reference number 346.

419. Barnes, E. K. 1984. Sierra sub-glacial potholes: their significance in California geology, with a note on archeology. Unpublished manuscript. 10 p.
Pothole formations in the Sierra are discussed as evidence of the extent of glaciation, drawing on examples from European geologic features. The various debates over the origin of the potholes are noted, especially the anthropogenic theories.

420. Bateman, P. C. and J. G. Moore. 1965. Geologic map of the Mount Goddard quadrangle, Fresno and Inyo Counties, California. U. S. Geologic Quadrangle Map GQ-429.
Geologic map of the 15 minute Mt. Goddard quadrangle of northern Kings Canyon with chemical analyses of the granodiorite and metavolcanic rock; no text is included.

421. Bushby-Spera, C. J. 1984. The lower mesozoic continental margin and marine intra-arc sedimentation at Mineral King, California. In Crouch, J. and Bachman, S. (eds.) Tectonics and Sedimentation Along the California Margin. Pacific Section S.E.P.M. 38:135-156.
The origin of the roof pendant rocks of the Mineral King area is discussed. These developed in shallow seas while the coastline was further east than at the present time and display evidence of periods of volcanic activity.

422. California Division of Mines and Geology. 1966. Geologic map of California, Fresno sheet.
Map scale of 1:250,000, includes much of the area of these Parks, no text included.

423. California Division of Mines and Geology. 1967. Geologic map of California, Mariposa sheet.
Map scale of 1:250,000, includes northern Kings Canyon National Park, no text included.

424. Des Marais, D. J., J. C. Tinsley, G. McCoy, B. W. Rogers, and S. R. Ulfeldt. 1980. The Contribution of Lilburn Cave to the Natural History of Sequoia and Kings Canyon National Parks, California. In Proceedings of the Conference on Scientific Research in National Parks (2nd). National Park Service, Washington D.C. Vol. 5:347-364.
Summarizes existing knowledge of Lilburn Cave, a 12,000 m long marble cave in Redwood Canyon. The cave is formed by a subsurface stream system characterized by an ebb and flow spring. The cave sediments record an early period of clay and silt sedimentation followed by an influx of granitic debris. Unusual minerals have been found in the marble, schist, and granite bedrock. High concentrations of radon and carbon dioxide are attributed to poor circulation of the cave atmosphere.

425. du Bray, E. A. and J. G. Moore. 1985. Geologic map of the Olancha quadrangle, southern Sierra Nevada, California. USGS Field Studies Map MF-1734.
Geologic map of the Olancha quadrangle, no text included.

426. Kennedy, M. J. and J. G. Lawless. 1985. Role of chemotaxis in the ecology of denitrifiers. Appl. and Environ. Microbiol. 49:109-114.
Chemotactic responses of several denitrifying bacteria to nitrate and nitrite additions were tested in samples cultured in soils from the mixed conifer zone of Sequoia, collected in the Log Creek study area.

427. MacKenzie, D. J. 1982. Sulfide deposits of the Mineral King mining district, Tulare County, California. M. S. Thesis. California State University, Los Angeles. 100 p.
The geology, mineralogy and petrology of sulfide deposits of the Mineral King area ore are examined, and the origins of these metal deposits related to the region's tectonic history .

428. McCoy, G. 1982. Analysis of fractures and speleogenesis at Lilburn Cave, Tulare County, California. Masters Thesis, San Jose State University. 83 p.
The distribution, orientation, and cave forming effects of jointing in the passages of Lilburn Cave are examined. A strong northwest trend of joints is paralleled by the average trend of the cave which indicate joint control of the access and flow of groundwater.

429. Moore, J. G. 1978. Geologic map of the Marion Peak quadrangle, Fresno County, California. U. S. Geologic Quadrangle Map GQ-1399.
Geologic map of the 15 minute Marion Peak quadrangle of southern Kings Canyon includes a text on the geologic history of the area.

430. Moore, J. G. 1981. Geologic map of the Mount Whitney quadrangle, Inyo and Tulare Counties, California. U. S. Geologic Quadrangle Map GQ-1545.
Geologic map of the 15 minute Mt. Whitney quadrangle with text about the geologic history of the region.

431. Moore, J. G. and F. C. W. Dodge. 1980. Late cenozoic volcanic rocks of the southern Sierra Nevada, California: I. geology and petrology: summary. Geological Soc. of Amer. Bull. 91:515-518.
This summary reports recent work on the tectonic setting, age and petrology of volcanic basalt rocks found in the southern Sierra. The composition of rock in the San Joaquin-Kings volcanic field is discussed.

432. Moore, J. G. and T. W. Sisson. 1985. Geologic map of the Kern Peak quadrangle, Tulare County, California. U. S. Geologic Quadrangle Map GQ-1584.
Geologic map of the 15 minute Kern Peak quadrangle, with text on the glaciation, volcanism, and faulting of the area which includes the major fault forming the Kern Canyon.

433. Rogers, B. W. 1980. Sequoia and Kings Canyon National Parks Karst Inventory. Cave Research Foundation. 328 p.
An inventory of all known karst resources in the Parks recorded a total of 88 features. No new major caves were discovered. The survey revealed cave use by vertebrate and invertebrate animals and 10 plant species. Several endemic and/or troglobitic species and one previously undescribed specie were found. Management recommendations emphasize protection of the cave resource and promoting public appreciation of caves and karst resources.

434. Rogers, B. W. 1981. Alpine karst in the Sierra Nevada, California. In Proceedings - 8th International Congress of Speleology. Vol. 2:544-546.
Caves in high elevation roof pendant layers from the Yosemite area south to Mineral King are described.

435. Rogers, B. W. and K. M. Williams. 1982. Mineralogy of Lilburn Cave, Kings Canyon National Park, California. NSS Bulletin 44:23-31.
The mineralogy of Lilburn Cave is quite varied and unusual, reflecting a complex geological setting at the interface of igneous and metamorphic rocks. Specimens of cave minerals were analysed and their composition and structure are discussed.

436. Sara, M. N. 1977. Hydrogeology of Redwood Canyon, Tulare County, California. Masters Thesis, University of Southern California. 129 p.
The geologic and hydrologic factors controlling the development of the Lilburn Cave system and the functioning of the ebb and flow spring system at Big Spring are examined. A sand plug in the lower passages of the cave system controls the ebb and flow cycle. Mathematical and scale models were generated to investigate the ebb and flow phenomenon.

437. Sisson, T. W. and J. G. Moore. 1984. Geology of Giant Forest-Lodgepole area, Sequoia National Park, California. U.S. Geological Survey Open-file Report 84-254. USGS, Menlo Park, CA. 13 p.
This report and accompanying map describe the geology of the Giant Forest-Lodgepole area. It includes descriptions of the morainal deposits in the Tokopah Valley and a discussion of the origin of sedimentary rocks within the area.

438. Tinsley, J. C., D. J. Des Marais, G. McCoy, B. W. Rogers, and S. R. Ulfeldt. 1981. Lilburn Cave's contribution to the natural history of Sequoia and Kings Canyon National Parks, California, USA. In Proceedings - 8th International Congress of Speleology. Vol. 1:287-290.
Presents an overview of the physical and geologic characteristics of Lilburn Cave in Kings Canyon.

439. Tinsley, J. C., D. R. Packer and S. R. Ulfeldt. 1981. Sedimentologic and speleogenetic implications of clastic deposits in central Lilburn Cave, Kings Canyon National Park, California, USA. In Proceedings - 8th International Congress of Speleology. Vol. 1:291-294.
Sediments preserved in Lilburn Cave record three episodes of deposition and erosion. The oldest strata may have been deposited over a period of 8000 years at a rate of 55mm/1000 years.

440. Wahrhaftig, C. 1965. Stepped topography of the southern Sierra Nevada, California. Geol. Soc. of Amer. Bull. 76:1165-1190.

Irregular steps of granitic rock face the San Joaquin Valley and canyons of major river drainages in the southern Sierra Nevada. The stepped formation is believed to result from differential weathering of granite, where weathering is more rapid in buried than in exposed rock. Accelerated erosion exposes the unweathered outcrops which act as local baselevels. This hypothesis raises questions about previous theories of topography in the Sierra.

441. Wahrhaftig, C. 1984. Geomorphology and glacial geology-Wolverton and Crescent Meadow Areas and Vicinity, Sequoia National Park, California; with sections on the geology of Emerald Lake Basin in relation to acid precipitation (J. G. Moore and C. Wahrhaftig) and Seismic refraction studies of the thickness of alluvium in the Wolverton ground-water basin and beneath Crescent Meadow (J. C. Tinsley). U.S Geological Survey Open-file Report 84-400. USGS, Menlo Park, CA 52 p.

A succinct synopsis of geologic processes in the southern Sierra Nevada precedes specific descriptions of geomorphology in these areas of Sequoia N. P. Groundwater study results on the availability of water for future developments are presented.

442. Baker, G. A., P. W. Rundel, and D. J. Parsons. 1980. The relationship between phenology and plant water stress of chaparral shrubs. In Proceedings - Conference on Scientific Research in National Parks (2nd). National Park Service, Washington D.C. Vol. 10:231-247.
Phenology and water stress of three chaparral shrubs of the Sequoia foothills were studied for two years following the severe drought of 1976-77. A general relationship between plant development and water stress exists with most growth ocurring in springtime preceeding periods of low water stress.

443. Baker, G. A., P. W. Rundel, and D. J. Parsons. 1981. Ecological relationships of Quercus douglasii (Fagaceae) in the foothill zone of Sequoia National Park, California. Madrono 28(1):1-12.
Quercus douglasii (blue oak) is the dominant deciduous tree of the foothill woodland communities of Sequoia. Studies included characterization of soil and environmental factors, phenological development, response to water stress, and seedling establishment. Seedling establishment is an irregular event; the greatest proportion of blue oaks in the Park are estimated to be 60-100 years in age with few young trees present.

444. Baker, G. A., P.W. Rundel and D. J. Parsons. 1982. Comparative phenology and growth in three chaparral shrubs. Bot. Gaz. 143(1):94-100.
Summer drought is a significant factor in plant growth and development in chaparral shrubs in the Park foothills. Phenological stages and plant water stress were studied in three shrubs - Adenostoma fasiculatum, Ceanothus cuneatus and Arctostaphylos viscida. Between site and between specie measurements were made in successive years in areas with different topographic characteristics. Each species has a unique pattern of vegetative and reproductive growth in response to drought.

445. Benedict, N. B. 1981. The vegetation and ecology of subalpine meadows of the southern Sierra Nevada, California. Ph.D. dissertation. Univ. of California, Davis. 128 p.
The dynamics of subalpine meadows in the Rock Creek area of Sequoia N. P. were analyzed using a plant community approach. The classification described in this thesis is based upon meadow location in relation to water sources, drainage patterns, and geologic features. Meadows are classified as hydric, mesic, or xeric depending on moisture, and plant associations within these types are described.

446. Benedict, N.B. 1982. Mountain meadows: stability and change. Madrono 29(3):148-153.

Meadow stability, as evidenced from palynological, stratigraphic and successional studies in the Sierra, is examined in terms of geologic and biologic conditions which can result in vegetation change. Such evidence indicates that meadow ecosystems are as stable as the surrounding vegetation but more sensitive to geologic change due to lower tolerance thresholds.

447. Benedict, N. B. 1983. Plant associations of subalpine meadows, Sequoia National Park, California. Arctic and Alpine Res. 15(3):383-396.

The vegetation of seven meadows was classified into 19 plant associations within three broad floristic types defined as hydric, mesic, and xeric. The vegetation data was ordinated with enviromental factors, of which soil moisture was the most significant. The author compares these plant associations with previous classification systems in an effort to develop a unified system for Sierran meadows.

448. Benedict, N. B. and J. Major. 1980. A physiographic classification of subalpine meadows of the Sierra Nevada of California. In Proceedings - Conference on Scientific Research in National Parks (2nd). National Park Service, Washington D.C. Vol. 4:323-336.

A physiographic classification system for Sierran meadows was developed based in large part on examination of meadows in the upper Kern River drainage. Meadow development resulting from varying geologic conditions is related to long term meadow stability.

449. Benedict, N. B. and J. Major. 1982. A physiographic classification of subalpine meadows of the Sierra Nevada, California. Madrono 29(1):1-12.

Two physiographic divisions of Sierran meadows are distinguished: meadows with vegetated margins, and meadows with sandy margins, both of which occur in a variety of topographic positions. The distribution and characteristics of the meadow types are discussed.

450. Bonnickson, T. M. and E. C. Stone. 1980. Reconstructing presettlement forests in National Parks: a new approach. In Proceedings - Conference on Scientific Research in National Parks (2nd). National Park Service, Washington D.C. Vol. 10:78-103.

Based on data from the Redwood Creek watershed, a view of the giant sequoia forest structure in 1890 is described through the study of present day plant aggregations. Changes due to the exclusion of fire are described and implications for management of vegetation in Park areas are examined.

451. Bonnickson, T. M. and E. C. Stone. 1981. The giant sequoia-mixed conifer forest community characterized through pattern analysis as a mosaic of aggregations. For. Ecology and Manage. 3:307-328.
Characteristics of the giant sequoia-mixed conifer forest of Redwood Canyon are described and analyzed as a mosaic of homogenous vegetation units or aggregations. Prescribed burned and unburned plots are compared. The authors conclude that the elimination of fire has probably been responsible for waves of reproduction which if continued may result in loss of natural aggregation boundaries.

452. Bonnickson, T. M. and E. C. Stone. 1982. Managing vegetation within U.S. National Parks: a policy analysis. Environ. Manage. 6(2):101-102 and 109-122.
National park vegetation management policies are briefly traced and ambiguities described. Alternative vegetation management policies are evaluated using data from a sequoia-mixed conifer forest in the Redwood Mountain area. An alternative to current policies, called the reconstruction-simulation approach, is described.

453. Bonnickson, T. M. and E. C. Stone. 1982. Reconstruction of a presettlement giant sequoia-mixed conifer forest community using the aggregation approach. Ecology 63(4):1134-1148.
A reconstruction of the sequoia-mixed conifer forest of Redwood Canyon using a backwards projection to approximately 1890 was made using aggregration analysis. An increase in the area of aggregations dominated by pole-size and mature trees corresponded with a decrease in sapling and seedling dominated aggregations. White fir aggregations showed a great increase in area for larger sized tree aggregations. Shrub aggregations and hardwoods showed loss in area .

454. Brooks, W. H. 1969. Some quantitative aspects of the grass-oak woodland in Sequoia National Park, California. Paper presented at Northwest Scientific Association annual meeting, Eastern Washington State College, March 21, 1969. 19 p.
Vegetative and edaphic factors were surveyed at four sites in the foothill oak woodland. Sites included areas subjected to grazing and recent fire as well as undisturbed areas. Blue oak, Quercus douglasii, was found to be the dominant specie of the stands.

455. Burke, M. T. 1982. The vegetation of the Rae Lakes Basin, southern Sierra Nevada. Madrono 29(3):164-176.
The alpine flora of the Sierra Nevada is composed of a large endemic element and a relatively small cosmopolitan artic-alpine group. This study characterizes the vegetation of the Rae Lakes Basin. Enviromental data was collected to describe the many micro-enviroments found within the basin. The vegetation data is ranked on the basis of floristic affinities and five alliances and twelve associations are recognized and described.

456. Cole, K. 1982. Late pleistocene vegetation of Kings Canyon, Sierra Nevada, California. Quaternary Research. 19:117-129.
Examination of a packrat midden in the Kings River Canyon has revealed significant changes in the vegetation since the late Pleistocene. Species which are abundant in the modern vegetation are missing in the older layers while species typical of more xeric conditions, such as western juniper, pinyon pine, and ponderosa pine are common. The presence of giant sequoia pollen suggests that Pleistocene groves were closer to the Kings Canyon area than presently.

457. Davis, M. B. 1985. Forest History of Sequoia National Park - feasibility study. Final contract to National Park Service. 14 p.
Sediment cores were taken at three locations to assess the potential of sites in Sequoia for a paleoecological study of vegetation and fire history. A lake core from Oriole Lake was given the most thorough examination. It indicated shifts in vegetation and fire frequency. It suggests the potential of the technique to yield further information if suitable sampling locations can be located.

458. Fins, L. and W. J. Libby. 1982. Population variation in Sequoiadendron: seed and seedling studies, vegetative propagation, and isozyme variation. Silvae Genetica 31(4):102-110.
Seed samples were collected from Sierra giant sequoia groves and examined for variations in their viability and genetic composition. Little recent gene flow is evident and genetic makeup of the most northern population varies substantially from the other populations. Data from such research may be important in cultivating sequoia as a commercial forest species.

459. Frost, W. T. 1935. The Vegetative-type Survey of Sequoia National Park, 1933-1934. Unpublished report to National Park Service. 88 p.
This map survey of Sequoia Park shows by means of symbols and colors the dominant species of plants and the estimated areal extent of the vegatation-type. The types were sketched from ocular observation from peaks and ridgetops. Areas of sequoia groves are named and briefly described.

460. Halpern, C. B. 1985. Hydric montane meadows of Sequoia National Park, California: a literature review and classification. NPS/CPSU-UC Davis Technical Report No. 20. 47 p.

The paper is presented in two parts. The first presents a literature review with accounts of human and livestock disturbances on Sierra meadows and a summary of meadow classification work. The second part develops a plant association classification. Major enviromental factors influencing vegetation structure are moisture gradients and site exposure and shading.

461. Heckard, L. R., and J. R. Shevock. 1985. Mimulus norrisii (Scrophulariaceae), a new species from the southern Sierra Nevada.

Mimulus norrisii, a new species of monkeyflower, is described. It is found on marble outcrops in the Sierran foothills, primarily in Sequoia National Park.

462. Mastrogiuseppe, R. J. and J. D. Mastrogiuseppe. 1980. Pinus balfouriana in the Klamath Mtns. and in Sequoia-Kings Canyon National Parks. In Proceedings - Conference on Scientific Research in National Parks (2nd). National Park Service, Washington D.C. Vol. 11:188-191.

Taxonomic characteristics of the northern and southern populations of Pinus balfouriana are compared. It is proposed that the southern Sierran population be designated a distinct subspecies.

463. Mastrogiuseppe, R.J. and J.D. Mastrogiuseppe. 1980. A study of Pinus balfouriana Grev. & Balf. (Pinaceae). Systematic Botany. 5(1):86-104.

The northern and southern populations of Pinus balfouriana are distinct in many characteristics, hence the southern Sierran population is given a subspecies name of austrina. Distinguishing characteristics of both populations are listed, as well as those of Pinus longaeva, which is similiar in many respects to the southern balfouriana population.

464. McClaren, M. 1983. Quercus douglasii stand age structure on grazed and ungrazed sites in Tulare County, California. Report to the Sequoia Natural History Association. 14 p. plus figures.

Previous studies have indicated an absence of recent regeneration of Quercus douglasii in foothill oak woodland areas of California. The effect of varying grazing regimes is evaluated as a single factor influencing survival. Ungrazed areas of the Park were shown to have a longer period of low regeneration than ranchland. No single factor explains this absence.

465. McClaren, M. P. 1985. Past, present and proposed status and management of selected backcountry meadows in Sequoia and Kings Canyon National Parks. Unpublished Report to National Park Service. 127 p.
Individual meadows are described by vegetation associations, history and use characteristics. Management classifications are suggested for inclusion within the meadow management and grazing management plans.

466. McClaren, M. P. 1985. A system to monitor species composition changes and soil and vegetation resources in the backcountry meadows of Sequoia and Kings Canyon National Parks. Unpublished report to the National Park Service. 27 p.
A method using plant frequency is proposed as a means for comparison of species composition changes over time under a variety of grazing intensities. An alternative method based on soil assessment and photos from permanent photo points is suggested for certain areas which have no comparable ungrazed meadows nearby.

467. Norris, L. L. 1981. Inventorying rare plant species. Park Science. 2(1):10.
To implement federal laws requiring the protection of rare plants, an inventory was made to locate and describe suspected populations of thirty species. The steps taken to compile plant lists, conduct field searches and compile the data into a useful form for park managers are described.

468. Norris, L. L. and D. A. Brennan. 1982. Sensitive Plant Species of Sequoia and Kings Canyon National Parks. National Park Service CPSU/UCD Tech Report No. 8. Davis, CA 120 p.
Twenty-four species of plants considered sensitive occur in the Parks and six others may possibly occur. Accounts of the population distribution, threats and management suggestions are made for each species, with illustrations.

469. Norris, L. L. and D. J. Parsons. 1984. Sensitive plant studies in Sequoia and Kings Canyon National Parks. Fremontia 12(3):14-19.
Managment policies for national park and wilderness lands require that rare plant species be protected. The steps taken by Sequoia and Kings Canyon to inventory the status of rare plants are described.

470. Parsons, D. J. 1980. California mixed subalpine. Pages 90-91 In Eyre, F. H. (Ed.). Forest Cover Types of the United States and Canada. Society of Amer. Foresters, Washington D. C.
Presents an overview of the composition, ecological relationships and associated vegetation of the mixed subalpine forests of the Sierra Nevada, Cascade and Klamath Mountains.

471. Parsons, D. J. 1982. The role of plant ecological research in Sierran park management: a tribute to Jack Major. Madrono 29(4):220-226.
Many significant studies of plant ecology in the Sierra Nevada have been guided by Jack Major, of the University of California, Davis. Dr. Major's interests, and those of his students, have contributed to the basic understanding of vegetation necessary for effective resources management throughout the Sierra.

472. Parsons, D. J., P. W. Rundel, R. P. Hedlund and G. A. Baker. 1981. Survival of severe drought by a non-sprouting chaparral shrub. Amer. J. Bot. 68(7):973-979.
The effects of a severe 2 year drought (1975-1977) on Arctostaphylos viscida in the foothill chaparral of Sequoia included severe dieback of branches and very low water potentials. The pattern of growth suggests that certain branches may be sacrificed with surviving ones receiving available resources.

473. Parsons, D. J. and H. T. Nichols. 1986. Giant sequoia management: a National Park Service perspective. In Proceedings: Giant Sequoia Management Workshop. USDA Forest Service Gen. Tech. Report (in press).
Giant sequoia management focuses on the continuation, and where necessary restoration, of natural ecosystem processes with which the species evolved. Restoration of a natural fire regime and reduction of human impacts are management objectives which involve park interpretation, research and management functions, concession operations and the general public.

474. Parsons, D. J. and T. J. Stohlgren. 1986. Long term chaparral research in Sequoia National Park. In Proceedings: Chaparral Ecosystem Research Conference. Santa Barbara, CA. (in press).
Extensive baseline data is being collected as part of a long term ecological research project in the chaparral zone of Sequoia National Park. Data on biomass, plant demographics, annual litterfall, nutrient pool allocation, precipitation and runoff chemistry are being collected in paired watersheds, one of which is planned to be burned in the near future to assess effects of fire.

475. Piirto, D. D. and W. W. Wilcox. 1981. Comparative properties of Old-growth and Young-growth Giant Sequoia of potential significance to wood utilization. Div. of Agric. Sci. Bull. 1901. Univ. of Calif., Berkeley. 168 p.
The properties of giant sequoia compare favorably with coast redwood and the author concludes that sequoia should be considered as planting stock for managed production forests.

476. Piirto, D. D., J. R. Parmeter, and W. W. Wilcox. 1984. Basidiomycete fungi reported on living or dead giant sequoia or coast redwood. Univer. of Calif Forestry and Forest Products Report No. 55. 4 p.
This is a compilation of the fungi reported to be found on Giant Sequoia or Coast Redwood.

477. Piirto, D. D., W. W. Wilcox, J. R. Parmeter and D. L. Wood. 1984. Causes of uprooting and breakage of specimen giant sequoia trees. Univer. of Calif. Div. of Agric. and Natural Resour. Bull. 1909. 13 p.
Giant Sequoia tree failure was examined in relation to fungus damage, carpenter ant excavation and physical disturbance. 21 of 33 study trees had root systems judged to be too decayed to provide support. In most cases of tree failure a combination of factors was involved.

478. Ratliff, R. D. 1982. A meadow site classification for the Sierra Nevada, California. USDA Forest Service Gen. Tech. Report PSW-60. 16 p.
In this initial attempt to quantitatively classify meadows in the Sierra, 90 sites were sampled and grouped by cluster analysis techniques into 14 classes. Indicator species, site characteristics and a dichotomous key describe class composition. Photos of the classes are included.

479. Ratliff, R. D. 1985. Meadows in the Sierra Nevada of California: state of knowledge. USDA General Tech. Report PSW-84. 52 p.
Presents a summary of information available on classification, restoration and management of meadows in the Sierra Nevada. Examples from these Parks are cited frequently.

480. Ratliff, R. D. 1985. Nutrients in Carex exserta sod and gravel in Sequoia National Park, California. Great Basin Naturalist 45(1):61-66.
Nutrients were found to be greater in Carex exserta sod than in unvegetated gravel at Siberian Outpost. The nutrient levels of the gravel were as in badly deteriorated or early seral situations. Comparisons were made as part of a study to investigate the possibilities of reestablishing short-hair meadows.

481. Ratliff, R. D. 1985. Rehabilitating gravel areas with short-hair sedge sod plugs and fertilizer. USDA Forest Service Research Note PSW-371. 4 p.
Rehabilitation of degraded subalpine gravel areas with plugs of short-hair sedge, the native ground cover of such areas, was tested by transplanting 2 sizes of plugs into fertilized and unfertilized quadrats. The most succesful treatment was large diameter plugs transplanted without pots and not fertilized. Fertilizer decreased the density of plants within the quadrats.

482. Rundel, P. W. 1982. Successional dynamics of chamise chaparral: the interface of basic research and management. Pages 86-90 In Proceedings - Symposium Dynamics and Management of Mediterranean-type Ecosystems. USDA Forest Service Gen Tech. Report PSW-58.
Study of succesional dynamics of vegetation communities such as chamise chaparral can and should provide a basis for management decisions. Examples are given of chamise population and nutrient flux studies in Sequoia which give implications for such management actions as controlled burning. Knowledge of plant ecological characteristics and fire behavior can provide a framework for understanding short and long term vegetation dynamics.

483. Rundel, P. W. 1983. Impact of fire on nutrient cycles in Mediterranean--type ecosystems with reference to chaparral. Pages 192-207 In Kruger F. J., D. T. Mitchell and J. U. M. Jarvis (Eds). Mediterranean-Type Ecosystems: The Role of Nutrients. Springer-Verlag, New York, N.Y.
The role of fire in nutrient cycling for chaparral type ecosystems has only recently been investigated. Current understandings of fire - nutrient relationships are summarized with examples from research at Sequoia.

484. Ryerson, D. 1983. Population structure of Pinus balfouriana Grev. and Balf. along the margins of its distribution area in the Sierran and Klamath regions of California. MA Thesis, Calif. State Univ. Sacramento. 198 p.
Populations of foxtail pine (Pinus balfouriana) were examined at the edges of it ranges in the Sierra and the Klamath Mountains. Site characteristics, population age distribution and factors limiting distribution were studied. Age class distribution indicates that foxtail have shifted to lower elevations in the southern and eastern portions of the Sierra.

485. Ryerson, D. 1984. Krummholz foxtail pines. Fremontia 11(4):30.
The physiognomic characteristics of atypical foxtail pines found in the Sierra and Klamath ranges are described. Krummholz foxtails were found at Monarch Lake, Sequoia National Park, in contrast to the usual form of an erect single trunk tree.

486. Scuderi, L. A. 1984. A dendroclimatic and geomorphic investigation of late-holocene glaciation, Southern Sierra Nevada, California. Ph.D. dissertation. Dept. of Geography, UCLA. 225 p.

This study uses tree ring width, lichen and geomorphological data to investigate when the more recent periods of glaciation occurred in the southern Sierra and what climatic conditions induced these glaciations. Tree ring width data allowed a finer resolution of the chronologic record than in previous studies. Periods of below normal ring width correlated with glacial advances dated through other techniques. Periods of below normal temperature and slightly below normal precipitation produced the major Holocene glacial advances.

487. Shevock, J. R. and L. L. Norris. 1981. The mountain parsleys of California. Fremontia 9(3):22-25.

The habitiat and distribution of the mountain parsleys, genus Oreonana, is described and a map of its distribution in the southern Sierra Nevada shows general locations of the three species. A key to the species is included.

488. Smith, D. W. 1980. A taxonomic survey of the macrolichens of Sequoia and Kings Canyon National Parks. M.A. Thesis. San Fransisco State University. 93 p.

Foliose and fruticose macrolichens were collected from thirteen sites in the Parks, which were previously unsurveyed for lichens. A key to the species collected is included.

489. St. John, T. V. 1980. Influence of litterbags on growth of fungal vegetative structures. Oecologia 46:130-132.

A comparison of experimental techniques used in vegetative litter decomposition studies was conducted in the mixed conifer forest at Whitaker's Forest.

490. Stohlgren, T. J., D. J. Parsons and P. W. Rundel. 1984. Population structure of Adenostoma fasiculatum in mature stands of chamise chaparral in the southern Sierra Nevada, California. Oecologia 64:87-91.

Vegetation dynamics were studied in pure chamise stands which are subject to periodic fire. A relatively high level of mortality in smaller individuals leads to a clumped distribution of individuals in mature stands. Seedlings replace dead individuals after a fire, restoring regular spacing to the stand.

491. Stohlgren, T. J., N. L. Stephenson, and D. J. Parsons. 1982. Using stem basal area to determine biomass and stand structure in chamise chaparral. Page 634 In Proceedings - Symposium Dynamics and Management of Mediterranean-type Ecosystems. USDA Forest Service Gen. Tech. Report PSW-58.

Stem basal area was correlated with shrub dry weight to estimate stand biomass. This is a simple non-destructive method to analyze chaparral community characteristics.

492. Stohlgren, T. J. and D. J. Parsons. 1986. Vegetation and soil recoverey in wilderness campsites. Environ. Manage. 10(3):.

The degree of impact within campsites varies from the central core to the periphery. Three years after closure to use the site central core showed less recovery from use than moderately impacted peripheral areas. Soils remained more compacted and plant cover showed less increase. Full recovery time for core areas remains speculative.

493. Vankat, J. L. 1982. A gradient perspective on the vegetation of Sequoia National Park, California. Madrono 29(3):200-214.

The environmental factors of elevation and topographic moisture conditions are used as axes for examining the distribution of vegetation types. Results indicate that elevation is the primary determinant of vegetation differences but in spite of the steep elevation gradients within the park, vegetation is best considered as a series of continua.

494. Wetmore, C. M. 1985. Lichens and Air Quality in Sequoia National Park. Final Report to National Park Service Denver Air Quality Office. 25 p.

A lichen survey was conducted to describe species within the Park, to assess current air pollution effects on lichens and determine the possibilities of using sensitive lichen species as bioindicators of pollutants. A species list was compiled. Lichens show no damaging air pollution effects at this time.

495. Wolford, J. L. 1975. Rooting of Sequoiadendron giganteum. Unpublished paper sponsored by the President's Undergraduate Fellowship Committee. Departments of Forestry and Genetics, Univ. of California, Berkeley. 13 p.

Rooting of Sequoia cuttings from seven age classes under 200 years were compared in tests of rooting media and hormone treatments. Cuttings rooted better in organic media and rooting success was greater in the younger age classes. The success of cuttings from young trees may indicate a method for mass propogation of Sequoia should it become commercially desirable.

See also reference numbers 381, 383, 385, 386, 389, 390, 392, 393, 395, 400, 403, 404, 405, 406.

496. DeBenedetti, S. H. and D. J. Parsons. 1983. Protecting mountain meadows: a grazing management plan. Parks. 8(3):11-13.
Meadow use by free roaming stock has existed in these Parks for nearly a century. Longtime concerns about meadow use prompted the development of a grazing management plan which is predictive and responsive of on-site conditions. Background research on varying levels of grazing intensity was undertaken. Grazing presciptions were generated and are modified based on weather and site use intensity. Success of the plan requires the understanding and involvement of user groups in the planning process.

497. Macleod, S. A. and D. J. Parsons. 1980. Measuring impacts of visitor use on backcountry camp areas. In Proceedings of the Conference on Scientific Research in the National Parks. (2nd). National Park Service, Washington D.C. Vol. 9:61-70.
A campsite inventory system for evaluating impacts on dispersed, undesignated campsites is presented. Biological and physical characteristics are used as a basis for measuring visitor impact.

498. Parsons, D. J. 1983. Wilderness protection: an example from the southern Sierra Nevada, USA. Environ. Conserv. 10(1):23-30.
High levels of visitor use in the backcountry of Kings Canyon had impacted the wilderness resource, causing concern to the public and park managers. Since 1961, a variety of controls on use including areawide closures, trailhead quotas, and fire and stock use restrictions have substantially reduced impacts. Management actions have allowed a greater number of visitors to the area but have reduced the total number of visitor nights. Public education programs encouraging minimum impact camping have created support for these backcountry management actions.

499. Parsons, D. J. and S. A. Macleod. 1980. Measuring impacts of wilderness use. Parks 5(3):8-12.
A system is presented to efficiently measure campsite impact in areas of rugged, remote terrain with undesignated campsites. A visual rating scheme to assess campsite damage was successfully used to inventory over 7,400 campsites in the Parks. Each site was mapped and given a rating on eight factors reflecting levels of impacts on soil, vegetation and crowding.

500. Parsons, D. J. 1986. Using campsite impact data as a basis for wilderness management decisions. In Proceedings - National Wilderness Research Conference. Ft. Collins. CO. USDA Forest Service Gen Tech. Report (in press).

The dispersal and impact class of backcountry campsites, together with management judgement, provided the basis for determining travel zone capacities for wilderness areas of Sequoia and Kings Canyon. Future trends can be evaluated and use restrictions adjusted based on the campsite study data base. This method can serve as a model for other wilderness areas in the process of defining acceptable impact levels.

501. Parsons D. J., T. S. Stohlgren and J. M. Kraushaar. 1982. Wilderness permit accuracy: differences between reported and actual use. Environ. Manage. 6(4):329-335.

Inaccuracies in reporting wilderness permit data result in over-reporting of total persons and of visitor nights. Errors result from noncompliance, transmission error, and changes in visitor plans. Exiting visitors were sampled at heavily used trailheads during August 1978 and their responses compared with the projected itinerary of their wilderness permit. Adjustments to wilderness permit data based on such information can improve the reliability of use reports.

502. Parsons, D. J., T. J. Stohlgren and P. A. Fodor. 1981. Establishing backcountry use quotas: an example from Mineral King, California. Environ. Manage. 5(4):335-340.

To alleviate resource damage from increasing use trailhead quotas were developed based on an inventory of campsite distribution and impact and visitor dispersal patterns. Field campsite surveys and data on use patterns from wilderness permits provided the basis for the restrictions.

503. Scuderi, M. R. 1981. An examination of the spatial behavior of wilderness users, with special reference to campsite selection - a case study in Sequoia and Kings Canyon National Parks, California. M. A. Thesis, Univ. of Washington. 174 p.

Campsite selection patterns based on visitor preference trade-offs among various environmental characteristics were examined and related to wilderness management theory and practice. The study was carried out in several backcountry areas.

504. Smith, N. R. 1980. Computer assisted reservation and permit system for use by U.S. National Park Service and National Forest Service. M. S. Thesis. California State University, Sacramento. 10 pages and appendices.

A prototype computer assisted wilderness reservation and permit management system is presented with the goal of monitoring use in park and forest areas in a timely and efficient manner. The system is designed to be flexible enough to be used in any park or forest although it had not been established in any area.

505. Stohlgren, T. J. 1982. Vegetation and soil recovery of subalpine campsites in Sequoia National Park, California. M. A. Thesis. California State University, Fresno. 49 p.

Several campsites near two heavily used subalpine lakes were closed to camping to investigate soil and vegetation recovery rates. The sites were stratified according to the degree of impact within the site, defining a barren core, an intermediate, and a peripheral zone, based on soil degradation and vegetation cover. Recovery rates were variable for the different zones. Soil recovery in the highly impacted barren core areas may be well over 50 years. Pooling recovery rates throughout the campsite could lead to erroneously short recovery times.

506. Stohlgren, T. J. 1986. Variation of vegetation and soil characteristics within wilderness campsites. In Proceedings - National Wilderness Research Conference. Ft. Collins, CO. USDA Gen. Tech. Report (in press).

Impact to the soil and vegetation within a campsite varies considerably. Visual stratification of sites correlated well with increased soil density, lower nutrient and organic matter levels, and fewer plant numbers and species. Information of this sort allows managers to make more realistic assumptions about recovery time of impacted sites.

507. Zuckert, J. A. 1980. Environmental and psychological determinants of campsite selection at a High Sierra lake. M. S. Thesis. Colorado State University. 72 p.

Differences are documented between campsite selection by experienced vs. inexperienced backpackers. Little time was spent on campsite selection by most parties and popular campsites tended to be highly visible and worn. The study was conducted at Charlotte Lake, Kings Canyon N. P.

See also reference numbers 349, 350, 458, 459, 492.

508. Andalaro, L. and R. R. Ramey II. 1981. The relocation of bighorn sheep in the Sierra Nevada of California. Environmental Field Program Publ. No. 7. University of California, Santa Cruz. 60 p.

Bighorn sheep captured from the Mt. Baxter herd were reintroduced on Wheeler Crest and in the Mt. Langley area in an attempt to establish herds in recent historic ranges. Herd movements and range formation, studied through radio telemetry and observations, appeared to indicate that the Wheeler Crest herd reintroduction was successful while the status of the Mt. Langley herd remains in doubt.

509. Andrews, T. 1980. A winter survey for wolverine (Gulo luscus) and other mammalian predators in Sequoia and Kings Canyon National Parks. Unpublished report to National Park Service. 30 p. plus maps.

The author spent two winters in the backcountry between Roaring River and the Middle Fork Kaweah River searching for sign of wolverine and other mammalian predators. The few wolverine tracks found indicate the animal is very rare. The author could not determine whether the population has declined in recent years. A table of historical sitings in and near the Parks is included.

510. Bradford, D. F. 1982 Oxygen relations and water balance during hibernation, and temperature regulation during summer, in a high elevation amphibian (Rana muscosa). Ph.D. Dissertation. University of California, Los Angeles. 173 p.

Rana muscosa, the mountain yellow legged frog, occurs in high elevation lakes and streams where it must contend with low air temperatures, ice covered waters for up to nine months, intense summer insolation and other enviromental stresses. Laboratory studies of oxygen consumption and osmoregulation of frogs and tadpoles show several mechanisms by which tadpoles survive in circumstances where frogs died over the winter. Summer field work on temperature modulation revealed methods of temperature control, however frogs in the field rarely achieved their preferred temperature.

511. Bradford, D. F. 1983. Winterkill, oxygen relations, and energy metabolism of a submerged dormant amphibian, Rana muscosa. Ecology 64(5):1171-1183.

Tadpoles are able to survive winter conditions of low temperature and oxygen depletion which may kill many adult frogs. The oxygen and energy relationships of both tadpoles and adult frogs are examined. The ability of the tadpoles to survive extreme high elevation winters allows populations to persist in isolated lakes despite the death of the adult population.

512. Bradford, D. F. 1984. Water and osmotic balance in overwintering tadpoles and frogs, Rana muscosa. Physiol. Zool. 57(4):474-480.
Water balance as affected by length of dormancy and body size was compared in frogs and tadpoles. Tadpoles differed from frogs in the amount and nature of edema but patterns are generally typical of those of overwintering species.

513. Cornett, D. C., W. M. Longhurst, R. E. Hafenfeld, T. P. Hemker and W. A. Williams. 1981. Potential impact of recreation development on the Mineral King deer herd. Final Report to U. S. Forest Service. 124 p.
A one year study (1976-1977) of the Mineral King deer herd was conducted to assess possible effects of a proposed ski development. Herd ecology, migration, plant species compostion and associated use of ranges were determined by field studies. Effects of human disturbance were evaluated at the current levels of visitor use and mitigation strategies suggested.

514. Cornett, D. C., W. M. Longhurst, R. E. Hafenfeld, T. P. Hemker and W. A. Williams. 1983. The Ecology and Management of the Mineral King Deer Herd. NPS/CPSU-UC Davis Technical Report No. 14. 94 p.
Historical information, literature review, and field work describe the population movements and use of deer in the Mineral King and nearby winter range areas. The impact of human activities in fawning areas was studied and determined to cause minimal disturbance. Suggestions for management of the Mineral King area include censusing of deer populations and forage, education of the public regarding deer use near trails and facilities, and cooperation with agencies responsible for management of adjacent property to preserve winter range.

515. Gold, J. R. and G.A. Gold. 1981. Systematics of golden trout, Salmo aguabonita, from the Sierra Nevada. Cal. Fish and Game 67(4):204-230.
The evolutionary relationships of the golden trout has been complicated by mixed and unknown ancestry of the present day trout populations. The native and non native trout show varying degrees of hybridization. Specimens from 14 trout populations were examined and seperated on the basis of charateristic similarities into two distinct groups of Salmo aguabonita and Salmo gairdneri strains. The systematics of the Little Kern Golden Trout are clarified.

516. Goldsmith, A., M. E. Walraven, D. Graber and M. White. 1981. Ecology of the black bear In Sequoia National Park. NPS/CPSU U.C. Davis, Tech. Report No. 1. 64 p.
Population characteristics and feeding patterns of black bears in the Giant Forest and Lodgepole areas were examined in 1974-75. Management recommendations are made to limit the amount of unnatural foods available to bears.

517. Graber, D. M. 1986. Conflicts between wilderness users and black bears: a Sierra Nevada case study. In Proceedings - National Wilderness Research Conference. Ft. Collins, CO. USDA Gen. Tech. Report (in press).

Continuing conflicts between backpackers and black bears in the Sierran national parks prompted studies of bear demographics and foraging behavior. Management options for both human and bear components of the problem have proven largely ineffective or intrusive of wilderness values. The bear-proof cannister offers the best potential solution due to its portability and low wilderness impact.

518. Helm, R. C. and C. Schonewald-Cox. 1985. Yellow-bellied marmots and vehicle damage in Mineral King, Sequoia National Park, California. Final Contract Report to National Park Service. 71 p.

Yellow-bellied marmots have been damaging cabins and vehicles in Mineral King since about 1980. Observations of marmot behavior at the parking lots in Mineral King were made. Literature review of marmot physiology and rodent damage indicated further possible avenues of investigation. Several management recommendations were made.

519. Hoffman, E. 1982. Bringing back the bighorns. Sierra 67(4):34-37.

The recent history of the Sierran bighorn population and the efforts to reestablish populations along the Sierra are described. Research done on sheep within the Parks is explained with reference to public use of sheep areas.

520. Jonasson, M. W. 1982. The foods and associated feeding ecology of the yellow-bellied marmot. M. S. Thesis, California State University, San Bernadino. 62 p.

Foods and feeding behavior of the yellow-bellied marmot were studied at Mineral King during the summers of 1980 and 1981. Marmots have a low reproductive rate but maintain relatively high populations through efficient food utilization and gathering behavior. Information presented includes trapping and tagging data, food species lists, and feeding activity patterns.

521. Miller, J. 1983. A natural history of the Sierra Nevada rosy finch (Leucosticte tephrocotis dawsoni) Unpublished report to National Park Service. 47 p.

Winter and summer field investigations of the ecology of the rosy finch were conducted in the Mitre Basin area of Sequoia. Range, nesting and breeding behavior, predation, and foraging are discussed for this bird of the Sierra alpine.

522. Miller, J. 1984. Breeding ecology of rosy finches and water pipits in the Sierra Nevada: a comparative study. Senior Thesis in Biology. Univ. Calif., Santa Cruz. 116 p.

Rosy finches and water pipits breed and summer in the alpine zone of the Sierra. This study compares foraging and nesting behavior and growth of the young. Little competitive overlap exists between species, which utilize different microhabitats within the Mitre Basin study area. A major food source for both species in the early season is aeolian or wind blown insects deposited on the snow surface. Pipits, which have only recently been documented as nesting in the Sierra, show a far greater level of nest predation than the Rosy Finch due to the openness of areas chosen for nest sites.

523. Norris, L. L. 1982. Birding Sequoia and Kings Canyon National Parks. Western Tanager. 48(5):4-6.

A birder's description of the Generals Highway describes place names and the species likely to be found there.

524. Norris, L. L. 1982. Nesting of water pipits in Sequoia and Kings Canyon National Parks. West. Birds 13:39-40.

Prior to 1975 water pipits were not known to nest in California. Recent observations of nesting and juvenile birds are described, confirming their occurrence as breeders in the Parks.

525. Norris, L. L. 1985. Plant communities and bird habitats in southern California; Part IV: the southern Sierra Nevada. Western Tanager 51(6):1-5 and 51(7):4-6.

This composite of birding information for the plant communities of the southern Sierra describes the major plant species charactersitic of the community and the birds likely to be found there throughout the year.

526. Wehausen, J. D. 1980. Sierra Nevada Bighorn Sheep: History and Population Ecology. Ph.D. Dissertation. Univ. of Michigan. 240 p.

The historic range and the subsequent decimation of the Sierra bighorn population is detailed. The general ecology, feeding habits and migratory patterns of the existing herds are presented. Recommendations for protection and perpetuation of the species and expansion of the present limited herd numbers are made.

527. Winter, J. 1980. Status and distribution of the great gray owl in California. Unpublished report to State of California Dept. of Fish and Game. 37 p.

The majority of sightings of the great grey owl in California are in the central Sierra Nevada, principally in the Yosemite area. A single reliable observation of a bird at Wolverton Meadow sets the southern limit of its range to Tulare County. The author speculates that the high grasses of the Park's montane meadows may be less suitable for great grey owls than the more numerous and larger meadows found from Yosemite north.

See also reference numbers 357, 456.

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